

broadest sweep when he is least capable of receiving it.

The 485 pages of reading matter and line drawings give the conspectus of the animal kingdom which it is hoped such a one may carry away. Prof. Graham Kerr in his preface sets himself three tasks: (1) To awaken and develop . . . interest in biological science. (2) To lay an adequate foundation for the superstructure of detailed knowledge of the animal body. (3) To provide a reasonably up-to-date account of the more important animal parasites, especially of the pathogenic microbes of animal origin.

The course represented by this book is preponderatingly morphological. The writer holds not only that our knowledge of the morphological features of the lower types of animal is much more advanced than our knowledge of their physiology, but also that morphological study affords a better intellectual discipline than physiological:

"The student observes structural features in the laboratory . . . and he is able to compare what he observes with what he is told or reads. When he tries to make physiological observations he finds even in the case of the simplest phenomena that behind these phenomena are at work factors, so far as he is concerned, transcendental and as far beyond his powers of criticism and comprehension as if they were the direct result of supernatural agency."

The only quarrel a student could have with the book is one which it shares with so many scientific works—that it is all so true. Few things are more devastating to the unformed mind than first contact with the vast mass of knowledge which the ant-like industry of man has piled up through the last three centuries. When the process of selection is also hidden, and the innumerable errors by which we have arrived at truth, the student is apt to think that those who have taught him so much can teach him all. His faculty of scepticism, before the brute mass of all this verity, lies down baffled, and his powers of disbelief are not reawakened for years, or for ever. The intellectual stimulus of finding a great clinician out-faced and routed at a post-mortem should not, even for the earliest years, be neglected if in any fashion it can be reproduced in zoological lecture-room or laboratory.

Therefore, although the anatomy of the higher vertebrates has been excluded from the course and the mass of detail pruned vigorously, one would plead for still further selection. By a glance at the countless mistakes of the past the investigator of the future will be encouraged. One would beg the teacher, in delivering that cataract of cer-

tainty which batters on the head of the first-year student, to remind him not only of the rightness but of the wrongness of the theories of the past, that he may pluck up heart to question those which now are current.

The book is well printed, and the line drawings are numerous and comprehensible. For examination purposes the summaries ending each chapter will prove of great value. The chapter on the Flagellata and that on the Crossopterygii are of special interest in view of the work done in these two fields by the Glasgow school.

The Study of Rocks.

Petrographic Methods and Calculations, with some Examples of Results Achieved. By Dr. A. Holmes. Pp. xix + 515 + 4 plates. (London: Thomas Murby and Co., 1921.) 31s. 6d. net.

DR. HOLMES has produced a text-book that is likely to have a far-reaching and beneficial effect in promoting the intelligent study of rocks. Some scientific treatises are patient compilations of the common stock of theories and facts current among specialists in the subject treated. If they are at least fairly accurate and reasonably up-to-date and complete they may be of great use to the student and research worker, even if they contain little or nothing that is original or novel. Others strike out a new and independent line of their own, and deal only with certain aspects of the subject on which the author feels he has a message to deliver. These, of course, have a value of their own, though they are not available as text-books or as works of reference.

The special characteristic of the work under review is the keenness of Dr. Holmes's outlook for fresh ideas in every department of his subject. Sometimes he has evolved them for himself, sometimes he has added new developments of his own to the methods that he has met with in his unusually wide reading. He even succeeds in making the well-worn subject of specific gravity interesting, and embodies much American work that has recently been published, as well as his own experience in the investigation of building stones. In dealing with the procedure for the separation of rock minerals, he does full justice to the advances that have been made in this country in the last few years. His novel diagrams showing at a glance the refractive indices and bi-refringence of minerals are remarkably successful in giving an idea of their relations to one another and the variations that occur. The chapter on microchemistry should prove very useful, and

his advice on the examination of thin sections and the description of rocks is excellent.

We cannot agree with his adoption of the meanings attached by Prof. Shand to the terms "saturated" and "unsaturated" as applied to minerals and rocks, meaning saturated or unsaturated with silica. It is always undesirable, we think, to take a recognised word, especially one with a definite scientific meaning already attached to it, and employ it in a more restricted sense. Perhaps the most valuable chapters in the book are those on the interpretation of analyses and their representation by diagrams. We could have wished, perhaps, that greater space could have been given to the subject of the crystallisation of magmas, but this could have been effected only by an increase in the size and cost of the book.

It is to be regretted that this work was completed before the issue of the report of the Joint Committee of the Geological and Mineralogical Societies on Petrological Nomenclature, to which Dr. Holmes, who was a member of the committee, gave most valuable assistance. It is very desirable that the use of technical terms in petrology should be standardised, at any rate so far as this country is concerned.

J. W. EVANS.

Our Bookshelf.

Insect Pests of Farm, Garden and Orchard. By E. Dwight Sanderson. Second Edition. Revised and enlarged. By Prof. L. M. Peairs. Pp. vi+707. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1921.) 26s. net.

THE first edition of the author's "Insects Injurious to Staple Crops" was published ten years ago. The advances made during the past decade have been such that it was considered necessary to rewrite practically the whole book. In its present form it covers all the more important insects affecting the crops of the farm, garden and orchard, besides including two final chapters on household insects and the pests of domestic animals. The work aims at giving a clear idea of the life-history and habits of every species concerned and the best methods of control. There are also chapters on insecticides and spraying and dusting apparatus. It is profusely illustrated, the text-figures numbering more than 600, and with few exceptions they are of a uniform level of excellence. References in the form of footnotes guide the more inquisitive reader to many of the separate bulletins and articles on individual pests.

Notwithstanding the number of text-books on economic entomology which have appeared in America, the present work will undoubtedly occupy a high place in their ranks. Its comprehensiveness is truly remarkable and, in fact, it

is difficult to quote any similar work which compresses so much well-sifted information, and so many good illustrations, within an equally convenient compass. Chap. 3, however, which deals with the structure and development of insects, is rather inadequate. In the first place it should have preceded chap. 2, which treats of beneficial insects. As it stands, the practical grower will have to read chap. 3 first if he is to understand properly the remarks in the preceding chapter. In the second place, a brief account of the principal orders of insects might have been added with advantage, even if at the expense of an additional page. But these points are comparatively trivial in what can be regarded unhesitatingly as an all-round first-rate practical book on insect pests.

A. D. IMMS.

Department of Applied Statistics (Computing Section), University of London, University College: Tracts for Computers. Edited by Karl Pearson. No. 6, *Smoothing*. By E. C. Rhodes. Pp. 60+3 diagrams. (London: Cambridge University Press, 1921.) 3s. 9d. net.

THE methods of graduating or "smoothing" a series of more or less irregular data affected by errors of observation or of sampling have of recent years received a good deal of attention; the present tract is a very valuable contribution to the subject. New methods are developed, which may be described as combinations of tangential or osculatory interpolation with the least-square method of Dr. Sheppard, and these and older methods are compared, both graphically and by finding the sum of the squares of the departures from the graduated curve. The results of this test are rather surprising. The osculating methods used give distinctly worse results than the other four methods employed. By grouping the observations it is possible to estimate what order of differences is negligible; if a higher order of differences is employed, the resultant curve tends to bring out something that is not inherent in the data, with very unsatisfactory consequences to the fit obtained.

North England: An Economic Geography. By L. R. Jones. Pp. viii+256. (London: G. Routledge and Sons, Ltd., 1921.) 6s. net.

THERE is a distinct need for sound regional text-books of the more intensive type exemplified by this work. It deals with the coal-fields north of the Trent and the Midland Gate, and discusses the industries which have arisen upon and about them, the communications between them, and their great centres of industry and trade. The basis of discussion is very largely geological. Here there is room for broadening of both foundation and fabric. The book needs an index, and is disfigured by a number of typographical errors, but it is well illustrated with maps which, for the most part, are clear and illuminating. It makes a very useful book for secondary schools and first-year college courses.